DOCKET NO. MEGENS 1-10-5 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Misha Megens, *et al.*
Serial No.:	10/040,017
Filed:	January 4, 2002
Title:	FABRICATING ARTIFICIAL CRYSTALLINE STRUCTURES
Grp./A.U.:	1756
Examiner:	Martin J. Angebranndt

Mail Stop Appeal Brief-Patents

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Signature of person signing certificate

ATTENTION: Board of Patent Appeals and Interferences

Sirs:

APPEAL BRIEF UNDER 37 C.F.R. §41.37

This is an appeal from a Final Rejection dated October 20, 2006, of Claims 1-10, 14-20, 22-23 and 26-29. The Appellant submits this Brief with the statutory fee of large entity as set forth in 37 C.F.R.§41.20(b)(2), and hereby authorize the Commissioner to charge any additional fees connected with this communication or credit any overpayment to Deposit Account No. 08-2395.

This Brief contains these items under the following headings, and in the order set forth below in accordance with 37 C.F.R. §41.37(c)(1):

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I. REAL PARTY IN INTEREST

The real party in interest in this appeal is the Assignee, Lucent Technologies Inc.

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences will directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-10, 14-20, 22-23 and 26-29 are pending in this application and have been rejected under 35 U.S.C. §102. Each of the pending claims and are being appealed.

IV. STATUS OF THE AMENDMENTS

The present Application was filed on January 4, 2002. The Appellant submitted Claims 1-18 in the application, and in a prior responses, amended Claims 1, 4, 5, 14, and 15, added Claims 19-29 and canceled Claims 11-13, 21, and 24-25. The Examiner issued a final rejection of Claims 1-10, 14-20, 22-23 and 26-29 on October 20, 2006. No amendments to the claims have been made subsequent to the Examiner's Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to artificially constructing crystalline structures. The method set forth in Claim 1 comprises exposing a photo-sensitive medium to an optical intensity pattern under conditions that inhibit or prevent the optical intensity pattern from producing refractive index

changes in the medium (e.g., step 14 in Figure 1, shown in Illustration 1 below; paragraphs [0009] and [0028] of the published application, U.S. 2003/0129501). The method also comprises then heating the exposed medium to stimulate a pattern of refractive index changes that is responsive to the optical intensity pattern during the exposing (e.g., step 16 in Figure 1; paragraphs [0010] and [0031] of U.S. 2003/0129501). The medium comprises acid neutralizer molecules and a material capable of undergoing a refractive index changing chemical reaction (e.g., paragraphs [0010] and [0057] of U.S. 2003/0129501).

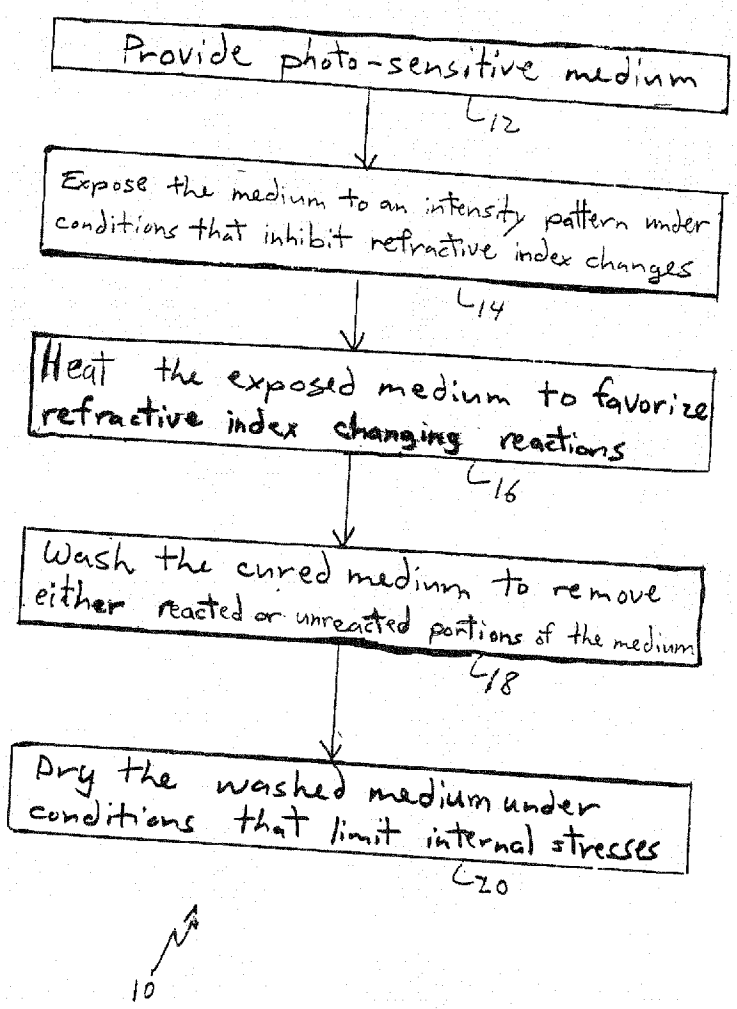

FIG. 1

Illustration 1

The method for making crystalline structures and devices as set forth in patentably distinct Claim 14 comprises providing a medium comprising acid neutralizer molecules, a material capable of undergoing a refractive index changing chemical reaction and photo-sensitizer molecules dispersed therein (e.g., paragraphs [0010], [0011] and [0057] of U.S. 2003/0129501). The photo-sensitizer molecules catalyze photo-chemical reactions in response to being activated by light of a wavelength, products of the photo-chemical reactions being able to stimulate the refractive index changes in the medium (e.g., paragraph [0011] of U.S. 2003/0129501). The method also comprises exposing the medium to an optical interference pattern that is produced by combining a plurality of mutually coherent beams of light of the wavelength, the exposing being done under conditions that inhibits or prevents the products of the photo-chemical reactions from causing the refractive index changes (e.g., paragraphs [0011] and [0028] of U.S. 2003/0129501).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The first issue presented for consideration in this appeal is whether Claims 1-10, 14-20, 22-23 and 26-29, are made obvious in accordance with 35 U.S.C. §103(a) by either Campbell, *et al.*, "Fabrication of Photonic Crystals for the Visible Spectrum by Holographic Lithography, Nature", Vol. 404, pp. 53-56 (03/2000). ("Campbell"), or Turberfield, "Photonic Crystals made by Holographic Lithography," MRS Bull, pp. 632-636 (08/2001) ("Turberfield"), in view of U.S. Patent 5,639,802 to Popovich *et al.* ("Popovich"), Neckers *et al.*, U.S. Patent 5,639,802 ("Neckers") and Oxman *et al.*, WO 99/62460 ("Oxman").

The second issue presented for consideration in this appeal is whether Claims 1-10, 14-20, 22-23 and 26-29, are made obvious in accordance with 35 U.S.C. §103(a) by either Campbell or

Turberfield, in view of Popovich, Neckers and Oxman, and further in view of U.S. Patent 4,402,571 to Cowan *et al.*

VII. APPELLANTS' ARGUMENT

For the reasons set forth below, the invention recited in Claims 1-10, 14-20, 22-23 and 26-29 are not made obvious by the art as applied by the Examiner.

A. Campbell and Tuberfield

Campbell describes a technique of three-dimensional holographic lithography for producing three-dimensional crystal structures with sub-micron periodicity (Campbell, Summary). Campbell uses a Ng:YAG laser (wavelength = 355 nm) to expose an epoxy-type photoresist (Campbell, page 53 column 2, line 24 to page 54, column 1, line 1). The photoresist contains the resin Epon-SU8, which has low absorption at the laser wavelength, dissolved in gamma-butyrolactone with a triaryl sulphonium salt acting as a photoacid generator (Campbell, page 54, column 1 lines 11-15). Campbell indicates that absorption of an ultraviolet photon by the photoacid generator liberates a hydrogen ion, and that acid catalyzed polymerization does not occur until the film is heated in a post-exposure bake (Campbell, page 54, column 1 lines 20-23). Campbell states:

> The duration of the laser pulse (6 ns) is short compared to the timescales of physical and chemical processes induced by exposure, so the interference pattern is unperturbed by photoinduced changes in the refractive index of the precursor. The short exposure also eases constraints on the mechanical stability of the optical components. (Campbell, page 54, column 1, lines 28-31)

Turberfield is a review article that cites back to Campbell (*see e.g.*, Turberfield, Page 633, Column 3).

B. Popovich, Neckers, Oxman and Cowan

Popovich is directed to illumination systems, in particular to light sources in video projection displays (Popovich, Column 1, Lines 12-13). Popovich forms holograph optical elements from a polymer dispersed liquid crystal (PDLC) material comprising a monomer, dispersed liquid crystal, a crosslinking monomer, a coinitiator and a photoinitiator dye (Popovich, Column 5, Lines 59-63). Popovich discloses the use of photoinitiator dyes sensitive to visible and near-infrared light (Popovich, Column 8, Lines 46-56) and coinitiators that control the rate of curing in the free radical polymerization reaction of the prepolymer material and that are suitable for use in producing holographic optical elements particularly for visible light (Popovich, Column 8, Lines 57 to Column 9 Line 6). Popovich states that the PDLC material is preferably exposed to the 488 nm line of an argon-ion laser with typical exposure times of 30-120 seconds (Popovich, Column 11, Lines 61-64).

Neckers is directed to compounds useful as fluorescers or photoinitiators (Neckers, Abstract). Neckers describes compositions which are photohardenable by cationic polymerization and which include a cationically polymerizable compound, a xanthene or fluorone dye, a hydrogen donor and an iodonium, thiapyrylium, diazonium or ferrocenium salt (Neckers, Column 4, Lines 15-19). In Example 1, Neckers discloses a cyclohexene oxide solution containing certain concentrations of ethyl erythrosine, diphenyliodonium hexafluoroantimonate, and N,N,2,4,6-pentamethylaniline, and when irradiated with visible light, is completely cured after 10 minutes of irradiation (Neckers Column 14, Lines 34-41). N,N,2,4,6-pentamethylaniline is used as the coinitiator because, according to Neckers, only aromatic amines with alpha-hydrogens are capable of initiating ring opening polymerization of cyclohexene oxide (Neckers, Column 10, Lines 60-62). Neckers states that if the coinitiator is too basic it will deactivate the cationic center responsible for initiation (Neckers,

Column 10, Lines 59-60). Neckers states that aliphatic amines, aromatic amines alpha- hydrogens and non-amine hydrogen donors are incapable of the initiation with cyclohexene oxide (Neckers, Column 10, Lines 62-65).

Oxman is directed to photopolymerizable dental compositions that polmerize initially to form a moldable gel that can be shaped and compacted. (Oxman, Title, page 1, lines 14-16). Oxman discloses that polymerizable hybrid compositions and methods of polymerizing in which the onset of cationic polymerization can be controllably delayed to extend the time between formation of the moldable gel and formation of the hardened solid (Oxman, page 1, lines 21-25). Oxman discloses that certain cationic polymerization modifiers can delay the initiation of cationically polymerizable groups (Oxman, Page 10, Line 26) and then upon initiation, increase the rate of polymerization (Oxman, Page 11, Lines 17-18). Oxman reports that the initiation of epoxy polymerization was delayed by minutes in experiment samples containing certain concentrations of cationic polymerization modifiers and irradiated for 30 min with wavelengths longer than 425 nm (Oxman, Table I page 29 and pages 25-28).

Cowan relates to producing surface relief patterns in photosensitive materials, and more particularly, producing surface relief patterns by exposing the photosensitive material to two different laser interference patterns (Cowan, Column 4, Lines 63-68) using visible wavelength Ar or He-Cd lasers (Column 2, Lines 58-60).

C. The Examiner has not established a *prima facie* case of obviousness of Claims 1-10, 19, 22-23, 28-29.

a. Failure to Clearly Explain Pertinence of Each Reference.

The Appellant respectfully submits that the Examiner has not met his burden of providing a basis for the rejection of Claims 1-10, 19, 22-23, 28-29 under 35 U.S.C. §103. As noted in 35 C.F.R. §1.104 (Nature of examination subsection (c) Rejection of Claims):

> (2) In rejecting claims for want of novelty or for obviousness, the examiner must cite the best references at his or her command. When a reference is complex or shows or describes inventions other than that claimed by the applicant, **the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified.** (emphasis added) *See* 35 C.F.R. §1.104(c)

Moreover, U.S. Court of Appeals Federal Circuit has stated:

> when the PTO asserts that there is an explicit or implicit teaching or suggestion in the prior art, it must indicate where such a teaching or suggestion appears in the reference. In re Rijckaert, 9 F.3d 1531, 1533, 28 USPQ2d 1955 (Fed. Cir. 1993) (citing In re Yates, 663 F.2d 1054, 1057, 211 USPQ 1149, 1151 (CCPA 1981).

Regarding the content of §103 rejections, the MPEP instructs the Examiner that:

> **It is important for an examiner to properly communicate the basis for a rejection so that the issues can be identified early and the applicant can be given fair opportunity to reply.** Furthermore, if an initially rejected application issues as a patent, the rationale behind an earlier rejection may be important in interpreting the scope of the patent claims. Since issued patents are presumed valid (35 U.S.C. §282) and constitute a property right 35 U.S.C. §261), the written record must be clear as to the basis for the grant. Since patent examiners cannot normally be compelled to testify in legal proceedings regarding their mental processes (see MPEP § 1701.01), **it is important that the written record clearly explain the rationale for decisions made during prosecution of the application**. (emphasis added) *See* MPEP §706.02(j)

In the present case, the vague grounds for rejection made by the Examiner leaves the Appellant to speculate about what aspects of the cited references the Examiner believes to teach or

suggest each and every element of each of Claims 1-10, 19, 22-23, 28-29. Because the basis for the rejection has not been clearly communicated, the Appellant has not been given a fair opportunity to reply to the rejections.

For example, with respect to Claim 1, the Examiner has not clearly explained which references teach or suggest exposing a photo-sensitive medium to an optical intensity pattern under conditions that inhibit or prevent the optical intensity pattern from producing refractive index changes in the medium. The Examiner has not clearly explained which references teach or suggest then heating the exposed medium to stimulate a pattern of refractive index changes that is responsive to the optical intensity pattern during the exposing. The Examiner has not clearly explained which references teach or suggest a medium comprising acid neutralizer molecules and a material capable of undergoing a refractive index changing chemical reaction.

b. Improper Combination of References

The Appellants submit that the asserted combination of the recited portions of Campbell or Turberfield with the recited portions of Popovich, Neckers and Oxman, or these references, further in view of the recited portions of Cowan, fail to establish a *prima facie* case of obviousness because these combinations are improper.

The Examiner asserts that it would be have been obvious to modify either Campbell's or Turberfield's process:

> ...with amine coinitators/polymerization modifiers to extend the spectral response of these compositions and control the rate and onset of polymerization as disclosed by Neckers et al. '802 and Oxman et al. WO99/62460 and to use a longer wavelength laser, such as the 488 nm output of an argon ion laser to perform the interferometric exposure as taught by Popovich et al. '152 which ahs [sic] the benefit of the laser beams being visible to the eye, which allows easy adjustment of the laser beams. (Examiner's Office Action of October 20, 2006, Section 3)

The Appellants submit that the combination of either Campbell or Turberfield with Popovich, Neckers and Oxman as applied by the Examiner is improper because no prior art motivation has been presented to modify Campbell or Turberfield's process according to the asserted teachings of Popovich, Neckers and Oxman. Rather, the Examiner has used hindsight to make these combinations.

The case law makes clear that one "cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." *Ecolochem, Inc. v. So. California Edison*, 56 USPQ2d 1065, 1073 (Fed. Cir. 2000), *In re Fine*, 837 F.2d 1071,1075, 5 USPQ2d 1780, 1783 (Fed. Cir. 1988). Hindsight knowledge of the Applicants' disclosure when the prior art does not teach or suggest such knowledge, results in the use of the invention as a template for its own reconstruction. This is inappropriate in the determination of patentability. *Sensonics Inc. v. Garlock, Inc.*, 220 USPQ 303, 312-313 (1983).

1. No motive shown to modify Campbell or Turberfield's use of UV light according to Popovich, Neckers, Oxman or Cowan

It is not apparent to the Appellants why one of ordinary skill in the art would be motivated to modify Campbell or Turberfield's process to extend the spectral response of these compositions, control the rate and onset of polymerization, or use a longer wavelength laser, as suggested by the Examiner.

For instance, Examiner has not explained why Popovich's teachings of the use of a photoinitiator dye allowing a sensitivity wavelengths in the visible spectrum (Popovich, Column 8, Line 35 to Column 9, Line 6) would motivate one to modify Campbell or Turberfield's use of an ultraviolet laser wavelength of 355 nm. The Appellants submits that this is unlikely, given Campbell

and Turberfield's teaching that their Epon-type photoresist has low intrinsic absorption at the 355 nm wavelength (Campbell, page 54, column 1 lines 11-15; Turberfield, Page 633, Column 3, Lines 28-29). It is important that the photoresist have a low absorption in Turberfeld and Campbell's processes because because attenuation of the laser fluence by absorption in the photoresist limits the thickness of structures that can be made dimensionally homogeneous (Campbell, page 54, column 1 lines 24-27).

Additionally, the Examiner has not pointed out where Campbell or Turberfield have identified the adjustment of their laser beam was problematic. Nor has the Examiner pointed out where Popovich, Neckers, Oxman or Cowan identify the easy adjustment of their laser beams as their reason for using visible wavelength of light. Rather, this asserted motivation appears to come from the Examiner himself, in hindsight of the present invention.

2. No motive shown to modify Campbell or Turberfield's process to use Povovich's coinitiator

It is not apparent to the Appellants why the recited portions of Popovich, teaching that a coinitiator that can control the rate of curing in a free radical polymerization reaction of prepolymer material, would motivate one to modify Campbell or Turberfield's process to include such a compound, when the Examiner has not cited disclosure by either Campbell or Turberfield that the control of their acid catalyzed process is problematic.

Moreover, Popovich exposes his PDLC material to 488 nm for exposure times of 30-120 seconds, which are many orders of magnitude longer than Campbell or Turberfield's 6 ns (i.e., $6x10^{-9}$ seconds) duration laser pulse. Campbell or Turberfield disclose that the chemical and physical processes induced by exposure are longer than their short exposure time, and that there are benefits associated with using such a short exposure time. That is, a short exposure time avoids the

perturbation of the interference pattern due to photoinduced changes in the refractive index of the precursor and easing constraints on the mechanical stability of the optical components. Given these benefits, the Appellants submit that one of ordinary skill in the art would not be motivated to modify Campbell or Tuberfield's process to include Popovich's coinitiator and use a visible light exposure for 30-120 seconds.

3. No motive shown to modify Campbell or Turberfield's process to use Necker's coinitiator

The Examiner has also not properly explained why Example 1 in Neckers would motivate one to modify Campbell or Turberfield's process by adding N,N,2,4,6-pentamethylaniline as a coinitiator. Neckers appears to use this coinitiator because it is an aromatic amine with alpha-hydrogens, and aromatic amines with alpha-hydrogens are capable of initiating ring opening polymerization of cyclohexene oxide (Neckers, Column 10, Lines 60-62). Campbell and Turberfield, however, are concerned with the polymerization of the resin Epon-SU8, not cyclohexene oxide. The Appellants submit that one of ordinary skill in the art would not be motivated to modify Campbell or Tuberfield's process by adding N,N,2,4,6-pentamethylaniline given that cyclohexene oxide is not being used in Campbell or Tuberfield's process, and Neckers's warning that the use of a coinitiator that is too basic will deactivate the cationic center responsible for initiation (Neckers, Column 10, Lines 59-60).

Moreover, like Popovich, Neckers's 10 minute visible light irradiation time is orders of magnitude longer than Campbell or Turberfield's 6 ns duration UV laser pulse. Therefore for the similar reasons as expressed above for Popovich, one of ordinary skill in the art would not be motivated to modify Campbell or Tuberfield's process to include Necker's coinitiator or visible light exposure for 10 minutes.

4. No motive shown to modify Campbell or Turberfield's process to use Oxman's modifier

Additionally, the Examiner has not properly explained why one of ordinary skill would have been motivated to modify Campbell or Turberfield's process by adding Oxman's modifiers. The recited portions of Oxman disclose modifiers that can delay the initiation of cationically polymerization of dental material so that this material can be moldable for a longer period. However, the Examiner has not cited disclosure by Campbell or Turberfield showing that delaying the initiation of polymerization and then increasing the rate of polymerization are desirable in the processes of Campbell or Turberfield. Rather, the Appellants submit that one skilled in the art would not want a three-dimensional crystal structure such as taught by Campbell or Turberfield to remain moldable for an extended period before polymerizing. This follows because, unlike Oxman's dental materials, Campbell or Turberfield's three-dimensional crystal structure is not being reshaped or remolded during the period after light exposure.

Also, like Popovich and Neckers, the recited portions Oxman disclosing visible light irradiation time of 30 min is orders of magnitude longer than Campbell or Turberfield's 6 ns duration UV laser pulse, thereby obviating the advantages of a short exposure time as disclosed by Campbell and Turberfield. Therefore, for the same reasons as expressed above for Popovich and Neckers, one of ordinary skill in the art would not be motivated to modify Campbell or Tuberfield's process to include Oxman's modifier or visible light exposure for 30 minutes.

The rejections based on the combination of the recited portions of Campbell or Turberfield with the recited portions of Popovich, Neckers and Oxman, further in view of the recited portions of Cowan are improper for the same reasons as stated above, in so far as the recited portions of Cowan are cited by the Examiner only for the proposition of teaching the use of argon and HeCd lasers.

D. The Examiner has not established a *prima facie* case of obviousness of Claims 14-18, 20 and 26-27.

a. Failure to Clearly Explain Pertinence of Each Reference

The Appellant respectfully submits that the Examiner has not met his burden of providing a basis for the rejection of Claims 14-18, 20 and 26-27 under 35 U.S.C. §103. As noted in 35 C.F.R. §1.104 (Nature of examination subsection (c) Rejection of Claims):

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In the present case, the vague grounds for rejection made by the Examiner leaves the Appellant to speculate about what aspects of the cited references the Examiner believes to teach or

suggest each and every element of each of Claims 14-18, 20 and 26-27. Because the basis for the rejection has not been clearly communicated, the Appellant has not been given a fair opportunity to reply to the rejections.

For example, with respect to Claim 14, the Examiner has not clearly explained which references teach or suggest providing a medium comprising acid neutralizer molecules, a material capable of undergoing a refractive index changing chemical reaction and photo-sensitizer molecules dispersed therein, the photo-sensitizer molecules to catalyze photo-chemical reactions in response to being activated by light of a wavelength, products of the photo-chemical reactions being able to stimulate the refractive index changes in the medium. The Examiner has not clearly explained which references teach or suggest exposing the medium to an optical interference pattern that is produced by combining a plurality of mutually coherent beams of light of the wavelength, the exposing being done under conditions that inhibits or prevents the products of the photo-chemical reactions from causing the refractive index changes.

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The Appellants submit that the asserted combination of the recited portions of Campbell or Turberfield with the recited portions of Popovich, Neckers and Oxman, or these references, further in view of the recited portions of Cowan, fail to establish a *prima facie* case of obviousness because these combinations are improper.

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Line 35 to Column 9, Line 6) would motivate one to modify Campbell or Turberfield's use of an ultraviolet laser wavelength of 355 nm. The Appellants submits that this is unlikely, given Campbell and Turberfield's teaching that their Epon-type photoresist has low intrinsic absorption at the 355 nm wavelength (Campbell, page 54, column 1 lines 11-15; Turberfield, Page 633, Column 3, Lines 28-29). It is important that the photoresist have a low absorption in Turberfeld and Campbell's processes because because attenuation of the laser fluence by absorption in the photoresist limits the thickness of structures that can be made dimensionally homogeneous (Campbell, page 54, column 1 lines 24-27).

Additionally, the Examiner has not pointed out where Campbell or Turberfield have identified the adjustment of their laser beam was problematic. Nor has the Examiner pointed out where Popovich, Neckers, Oxman or Cowan identify the easy adjustment of their laser beams as their reason for using visible wavelength of light. Rather, this asserted motivation appears to come from the Examiner himself, in hindsight of the present invention.

2. No motive shown to modify Campbell or Turberfield's process to use Povovich's coinitiator

It is not apparent to the Appellants why the recited portions of Popovich, teaching that a coinitiator that can control the rate of curing in a free radical polymerization reaction of prepolymer material, would motivate one to modify Campbell or Turberfield's process to include such a compound, when the Examiner has not cited disclosure by either Campbell or Turberfield that the control of their acid catalyzed process is problematic.

Moreover, Popovich exposes his PDLC material to 488 nm for exposure times of 30-120 seconds, which are many orders of magnitude longer than Campbell or Turberfield's 6 ns (i.e., $6x10^{-9}$ seconds) duration laser pulse. Campbell or Turberfield disclose that the chemical and physical

processes induced by exposure are longer than their short exposure time, and that there are benefits associated with using such a short exposure time. That is, a short exposure time avoids the perturbation of the interference pattern due to photoinduced changes in the refractive index of the precursor and easing constraints on the mechanical stability of the optical components. Given these benefits, the Appellants submit that one of ordinary skill in the art would not be motivated to modify Campbell or Tuberfield's process to include Popovich's coinitiator and use a visible light exposure for 30-120 seconds.

3. No motive shown to modify Campbell or Turberfield's process to use Necker's coinitiator

The Examiner has also not properly explained why Example 1 in Neckers would motivate one to modify Campbell or Turberfield's process by adding N,N,2,4,6-pentamethylaniline as a coinitiator. Neckers appears to use this coinitiator because it is an aromatic amine with alpha-hydrogens, and aromatic amines with alpha-hydrogens are capable of initiating ring opening polymerization of cyclohexene oxide (Neckers, Column 10, Lines 60-62). Campbell and Turberfield, however, are concerned with the polymerization of the resin Epon-SU8, not cyclohexene oxide. The Appellants submit that one of ordinary skill in the art would not be motivated to modify Campbell or Tuberfield's process by adding N,N,2,4,6-pentamethylaniline given that cyclohexene oxide is not being used in Campbell or Tuberfield's process, and Neckers's warning that the use of a coinitiator that is too basic will deactivate the cationic center responsible for initiation (Neckers, Column 10, Lines 59-60).

Moreover, like Popovich, Neckers's 10 minute visible light irradiation time is orders of magnitude longer than Campbell or Turberfield's 6 ns duration UV laser pulse. Therefore for the similar reasons as expressed above for Popovich, one of ordinary skill in the art would not be

motivated to modify Campbell or Tuberfield's process to include Necker's coinitiator or visible light exposure for 10 minutes.

4. No motive shown to modify Campbell or Turberfield's process to use Oxman's modifier

Additionally, the Examiner has not properly explained why one of ordinary skill would have been motivated to modify Campbell or Turberfield's process by adding Oxman's modifiers. The recited portions of Oxman disclose modifiers that can delay the initiation of cationically polymerization of dental material so that this material can be moldable for a longer period. However, the Examiner has not cited disclosure by Campbell or Turberfield showing that delaying the initiation of polymerization and then increasing the rate of polymerization are desirable in the processes of Campbell or Turberfield. Rather, the Appellants submit that one skilled in the art would not want a three-dimensional crystal structure such as taught by Campbell or Turberfield to remain moldable for an extended period before polymerizing. This follows because, unlike Oxman's dental materials, Campbell or Turberfield's three-dimensional crystal structure is not being reshaped or remolded during the period after light exposure.

Also, like Popovich and Neckers, the recited portions Oxman disclosing visible light irradiation time of 30 min is orders of magnitude longer than Campbell or Turberfield's 6 ns duration UV laser pulse, thereby obviating the advantages of a short exposure time as disclosed by Campbell and Turberfield. Therefore, for the same reasons as expressed above for Popovich and Neckers, one of ordinary skill in the art would not be motivated to modify Campbell or Tuberfield's process to include Oxman's modifier or visible light exposure for 30 minutes.

The rejections based on the combination of the recited portions of Campbell or Turberfield with the recited portions of Popovich, Neckers and Oxman, further in view of the recited portions of Cowan are improper for the same reasons as stated above, in so far as the recited portions of Cowan are cited by the Examiner only for the proposition of teaching the use of argon and HeCd lasers.

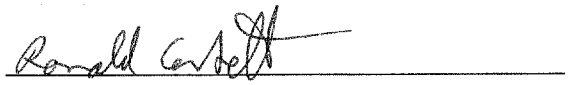
In view of the foregoing remarks, the cited references do not support the Examiner's rejection of Claims 1-10, 14-20, 22-23 and 26-29 under 35 U.S.C. §103(a). The Appellants therefore respectfully requests the Board to remove the rejection of Claims 1-10, 14-20, 22-23 and 26-29.

E. Conclusion

For the reasons set forth above, the Claims on appeal are patentably nonobvious over the recited portions of Campbell or Turberfield with the recited portions of Popovich, Neckers and Oxman, or these references, further in view of the recited portions Cowan. Accordingly, the Appellant respectfully requests that the Board of Patent Appeals and Interferences reverse the Examiner's Final Rejection of all of the Appellant's pending claims.

Respectfully submitted,

Hitt Gaines, P.C.



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VIII. APPENDIX A - CLAIMS

1. A method, comprising:

exposing a photo-sensitive medium to an optical intensity pattern under conditions that inhibit or prevent the optical intensity pattern from producing refractive index changes in the medium; and

then, heating the exposed medium to stimulate a pattern of refractive index changes that is responsive to the optical intensity pattern during the exposing,

wherein the medium comprises acid neutralizer molecules and a material capable of undergoing a refractive index changing chemical reaction.

2. The method of claim 1, wherein the condition includes that a temperature of the medium is lower than a temperature of the medium during the heating.

3. The method of claim 1, further comprising:

exposing one or more points or lines in the medium with light that causes photo-chemical reactions in the medium via multiple-photon absorption events.

4. The method of claim 1, wherein the heating produces the pattern of refractive index changes by causing the chemical reaction selected from the group consisting of polymerization of oligomers, stimulating deprotection of portions of polymers, and stimulating crosslinking of polymers.

5. The method of claim 1, wherein the acid neutralizer molecules are able to neutralize photo-chemical reaction products produced by the exposing, the products being able to stimulate the chemical reaction that produces the pattern of refractive index changes.

6. The method of claim 1, wherein the optical intensity pattern is produced by interfering at least three mutually coherent light beams.

7. The method of claim 6, wherein the pattern of refractive index changes tracks the optical intensity pattern.

8. The method of claim 6, wherein the heating causes refractive index changing reactions in regions of the medium where the exposing activated photo-sensitizer molecules dispersed in the medium.

9. The method of claim 6, wherein the heating includes heating the medium to a temperature of a rubber-like phase.

10. The method of claim 6, wherein the heating produces a pattern of refractive index changes that is periodic and non-constant in three independent directions.

Claims 11-13 (Canceled)

14. A method for making crystalline structures and devices, comprising:

providing a medium comprising acid neutralizer molecules, a material capable of undergoing a refractive index changing chemical reaction and photo-sensitizer molecules dispersed therein, the photo-sensitizer molecules to catalyze photo-chemical reactions in response to being activated by light of a wavelength, products of the photo-chemical reactions being able to stimulate the refractive index changes in the medium; and

exposing the medium to an optical interference pattern that is produced by combining a plurality of mutually coherent beams of light of the wavelength, the exposing being done under conditions that inhibits or prevents the products of the photo-chemical reactions from causing the refractive index changes.

15. The method of claim 14, wherein the acid neutralizer molecules neutralize a portion of the products, the neutralized portion of the products being unable to cause refractive index changes in the medium.

16. The method of claim 14, further comprising: heating the exposed medium to stimulate the products to cause refractive index changes in the medium.

17. The method of claim 16, wherein the photo-sensitizer molecules are visible dye molecules and the products cause polymerization, deprotection, or crosslinking reactions in the medium in response to the heating.

18. The method of claim 16, wherein the heating produces an interconnected open polymerized structure.

19. The method of claim 1, wherein the photo-sensitive medium comprises both photo-sensitizer molecules and photo-acid generator molecules dispersed therein.

20. The method of claim 14, wherein the medium further comprises photo-acid generator molecules dispersed therein.

Claim 21. (Canceled)

22. The method of claim 1, wherein the optical intensity pattern is produced by exposing the medium to visible light.

23. The method of claim 1, wherein the optical intensity pattern is produced by exposing the medium to visible light ranging from 470 nm to 560 nm.

Claims 24-25 (Canceled)

26. The method of claim 14, wherein the light is of a visible wavelength.

27. The method of claim 14, wherein the wavelength of light ranges from 470 nm to 560 nm.

28. The method of claim 1, wherein the acid neutralizer molecules comprise a base that neutralizes an acid that catalyzes the chemical reaction.

29. The method of claim 1, wherein the acid neutralizer molecules comprise triethyl amine or N,N,2,4,6-pentamethylaniline.

IX. APPENDIX B - EVIDENCE

NONE

X. RELATED PROCEEDINGS APPENDIX

NONE